REBUILDING SCORING CRITERIA

USED TO CLASSIFY CHINOOK INDICATOR STOCKS

by

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REBUILDING SCORING CRITERIA

USED TO CLASSIFY CHINOOK INDICATOR STOCKS

A comparative analysis by
Norma Jean Sands

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FOREWORD FOR REVISED EDITION

This document was first written to clarify the differences in classification by three rebuilding scoring criteria systems under consideration by the Rebuilding Assessment Work Group (RAWG) of the Chinook Technical Committee (CTC). As the end of the Pacific Salmon Treaty (PST) chinook rebuilding period nears (1998), the scoring criteria system used to classify the indicator chinook stocks becomes a less critical tool since it is rather obvious which stocks have responded positively to the rebuilding program and which have not. At this point in time it is important to start looking at individual stocks to determine why some have improved and others not; there is no point in increasing restrictive management measures if those measures will not improve the status of the remaining stocks needing rebuilding.

While the main aim of this document was to compare the results of the three scoring criteria over time for each indicator stock, the comparisons were also judged against the escapement patterns of the individual stocks and, thus, allow a review of the various types of responses to the rebuilding program. This can provide some insight as to what questions to ask to determine what might be affecting the escapement levels. For example, both the West Coast of Vancouver Island (WCVI) stock and the Green River stock are, in 1993, at 43% of their respective escapement goals, but the WCVI stock has been below rebuilding target levels (i.e., base-to-goal line) throughout the rebuilding period while the Green River stock has been above goal for 5 consecutive years during the rebuilding period. Is the WCVI escapement goal realistic or has the exploitation rate remained high on this stock despite management restrictions? Was the decline in the Green River stock in the middle of the rebuilding period due to over-escapement, poor marine survival, or increased harvest pressure?

Table 2 and 4 of this report give information on the rebuilding classifications and escapement patterns of the stocks throughout the rebuilding period. Table 2, with stocks sorted by geographic area, gives the rebuilding classification for each stock annually from 1985 to 1993 and Table 4, with stocks sorted by rebuilding status category, verbally describes the escapement patterns over the rebuilding period. .

INTRODUCTION AND METHODS

The rebuilding scoring criteria were developed by the Rebuilding Assessment Work Group (RAWG) of the Chinook Technical Committee (CTC) to test for progress on the rebuilding of chinook escapements to goal levels. Progress in escapement levels was compared to a base-to-goal linear line over the 15 year rebuilding period. It was logical to use a criterion that measured a trend based on linear regression since this eliminated the need to assume shape parameters for nonlinear growth. However, as time progressed,

several of the indicator chinook stocks showed either much annual variation in escapement levels (e.g., Nass River through 1990) or an initial large increase in escapements followed by a decrease and then increases (e.g., Stikine through 1993), such that linear regression analysis often showed no significant linear trend in the data although escapements were, on average, increasing. For several years, various alternative scoring criteria were developed, tested, and discarded by RAWG. One change that was made was the introduction of an Above Goal criterion; stocks were first tested against the Above Goal criterion and, if they passed, they were not subjected to the rebuilding criteria, but were directly classified as Above Goal. For the 1993 annual report of the CTC, a modified set of criteria were adopted.

In this document, I compare the behavior of three different scoring criteria systems: 1) the original, old CTC system described in CTC annual reports prior to 1993, 2) a buffer system examined and rejected by the RAWG, and 3) the new CTC system as presented in Chapter 2 of the 1993 CTC annual report (TCCHINOOK (94)-1). The buffer system differed in part from the other two systems in that it used a stock's inherent variability in escapement levels to allow variation within a buffer zone around the target escapement level (i.e., base-to-goal line) when determining if the escapement met the criteria. The three systems of scoring criteria are summarized in Table 1.

Indicator chinook stocks subjected to the rebuilding criteria were then scored and classified as to whether they were rebuilding or not. The classifications used for the two CTC systems follow that explained in the CTC reports (TCCHINOOK (93)-2, TCCHINOOK (94)-1) including, for the old CTC system, the different scoring for the three successive phases of the rebuilding period. The classifications used for the old and buffer system include: AG = above goal, R = rebuilding, PR = probably rebuilding, IND = indeterminate, PN = probably not rebuilding, N = not rebuilding. The new CTC system dropped the two 'probably' classifications: PR and PN. The classification for the buffer system is based on the total score of the two rebuilding criteria as follows:

if +2 then R, if +1 then PR, if 0 then IND, if -1 then PN, and if -1 then N.

When stocks have been classified as indeterminate by either CTC system, the RAWG then reviews these stocks and votes on whether to change the classification to either rebuilding or not rebuilding and that revised classification is what is reported in the CTC annual reports. In order to compare the classifications made by the scoring criteria systems, I have used the objective system classification rather than the subjective voting classification, but indicate in tabled results when changes were made by RAWG.

The two new criteria systems differ from the original system in looking at short-term (5-yr) means and trends rather than long-term ones (up to the full 15 years of the rebuilding program). The buffer system has only three criteria: above-goal, mean, and line criteria; while the two CTC systems each have four: above-goal, mean, line and trend. The mean and line criteria compare actual escapements (or averages) with a targeted escapement level defined as the point on the base-to-goal line for that year; base being the base period average escapement level and goal being the given escapement goal. The trend criterion for the old CTC system used linear regression while the that for the new CTC system simply compares a year's escapement level with that of the previous year to test for an increment or decrement.

RESULTS AND DISCUSSION

Results from applying the three scoring systems to the escapement data, determining the classification for each year from 1985 using data up to that year, is given in Table 2. Current updated data and escapement goals as presented in the CTC 1993 Annual Report (TCCHINOOK (94)-1) are used for all years in these comparisons. Table 3 compares the 1993 rebuilding classifications given each stock by the three scoring systems. In Table 3 the stocks are ordered by geographic area. In Table 4 the stocks are sorted by escapement pattern and the classifications are compared verbally in the comments column for the entire rebuilding period. The status categories for the escapement patterns, developed for this paper, are:

Above Goal: Are currently classified above goal.

Previously Classified Above Goal: Have been classified above goal sometime during the rebuilding period; this means being above goal at least four years during rebuilding.

Looks Like It Is Rebuilding: Showing a general increasing trend during the rebuilding period and are currently at or above goal levels.

Was Rebuilding Once: Showed some signs of rebuilding in the earlier years of the rebuilding period.

Never Showing Improvement - Fairly Steady Returns: Escapement levels have maintained a steady level of return at or below the base period level.

Never Showing Improvement - Variable Returns: Escapement levels fluctuate greatly from year to year, but on average are near the base level.

Never Showing Improvement - In Decline: Have shown a decline in escapement levels during the rebuilding period.

One of the reasons for changing the classification system was that the old CTC system resulted in so many indeterminate classifications. In comparison, the old CTC classification system generally classified stocks which showed signs of either increasing or decreasing as indeterminate for a longer period of time than the new systems before changing to a rebuilding or not-rebuilding classification (e.g., Situk, Andrew Creek, Yakoun, Quillayute Summers, Green). Over the 36 stocks and 9 years of applying the classifications in this comparison study, the old CTC system made 98 indeterminate classifications, the buffer system 21, and the new CTC system 33. For the old CTC system, most of these indeterminate classifications (58) were made during the first four years (1985-1988). In the early years, the old CTC system was less likely to classify a stock to rebuilding or not rebuilding (e.g., Area 6, Harrison, WCVI, Col R springs and summers). Over the last three years (1990-1993), the old system classified 10 stocks as indeterminate for a total of 21 indeterminate classifications; the buffer system, 3 stocks, 3 indeterminates; and the new CTC system, 9 stocks, 12 indeterminate's.

The trend criterion has always caused much debate about what it was measuring; should it be measuring the trend over the entire rebuilding period or only over the most recent, say 5, years. This could make quite a difference in stocks that exhibit a cyclic pattern or a marked increase followed by a decline; the long-term analysis would show no trend in these cases and the short-term analysis results would change with time from positive to negative trends (e.g., Blossom and Chickamin before the goals were lowered, lowering the goal put these stocks into the Above Goal category and a trend analysis was not needed).

The trend criterion for the new CTC system was limited to the most recent 5 years; however, it appears to be more of a noise criterion than a trend criterion due to the algorithm used of comparing each year with the previous year. A stock could have a positive trend but score a zero on this criterion quite easily by fluctuating up and down each year while showing an overall positive trend. However, this criterion turns out to only affect the classification if it has a score of -1; it can then reduce the classification from a potential rebuilding to indeterminate or from a potential indeterminate to not rebuilding. For the Grays Harbor springs and falls, which both had been classified as Above Goal in 1992, it was the new trend criterion that brought them down from a potential rebuilding classification to indeterminate (voting by RAWG members changed the reported classification to R). Since these two stocks had been above goal, it is natural that the escapement levels would fluctuate up and down from year to year rather than continue to increase. This trend criterion is not a useful one for stocks that have already reached goal levels at some time during the rebuilding period. The buffer system does not have a so called trend criterion, although the line criterion could be viewed as a positive trend criterion since it measures fitness with the increasing base-to-goal target line.

An interesting result of the new CTC system is in the classification of the Taku stock which has been showing an general increase in escapements during the rebuilding period. The new CTC system classifies it as not rebuilding for every year up to 1993 and classifies it as indeterminate in 1993. The reason is that, although the Taku escapements are increasing, most of the escapement levels have been just below the base-to-goal rebuilding target line (see graph in appendix B of annual report). The old CTC and the buffer systems classify the Taku stock as probably rebuilding or rebuilding since 1990 (except indeterminate for buffer system in 1991). To test the behavior of the new CTC scoring system, a number of simulation runs using a hypothetical stock that follows the base-to-goal line with 10% random deviations from year to year were made and were found to classify the stock as not rebuilding 22% of the time and as indeterminate 55% of the time. This is because the new CTC system uses the target base-to-goal line as a minimum value to attain, not an average value to attain. This points out the importance of identifying the target level, whether it be an annual rebuilding target or an escapement goal, as a minimum or average level to attain. Some agencies treat escapement goals as minimum levels and others as average levels (e.g., mid point in a range) to be obtained. The target level should be compatible with what the criteria test.

For some stocks, the three scoring systems give very different classification results. The Blossom stock was classified in 1991, 1992 and 1993 as not rebuilding by the old CTC system, rebuilding by the buffer system, and indeterminate by the new CTC system. The old CTC system classified it as not rebuilding since two of the most recent three escapements were below the base-to-goal line and there was no significant linear trend over the rebuilding period (escapements were coming down after high levels in 1986 and 1987). The buffer system classified it as rebuilding since only one of the most recent five escapements were below the buffered base-to-goal line (note that the buffer systems treats the target as an average level rather than a minimum level). The new CTC system classified it as indeterminate since four of the last five escapements were lower than the previous year's escapement (some of those declines occurred while escapements were above goal).

This classification pattern by the three systems was also observed for the Keta in 1992, the Unuk in 1991, the Chickamin in 1992; all those stocks were just coming out of the Above Goal category in those years. Three of the remaining four stocks coming out of the Above Goal category were also classified as

indeterminate by the new CTC system (Upper Fraser and Grays Harbor springs and summers).

For the Keta stock, the high escapements in 1986-1988 kept the 5-year mean high through 1992. In 1993, although the escapement increased over what it has been the previous three years and was above goal, the classification dropped to indeterminate from previous year's rebuilding because of the lowered 5-yr mean.

The Chickamin stock, which was classified Above Goal through 1991, was classified as indeterminate by the new CTC system in 1992 and rebuilding in 1993. In 1992 the escapement fell below the base-to-goal line; in 1993 the escapement was up just a little, but still below the base-to-goal line. In both years, the mean and line criteria would have classified the stock as R. By adding the trend criterion, in 1992 four of the most recent 5 escapements were below the previous years escapements and this put the stock in the indeterminate class even though in two of those years the declines represented years when the stock was still above goal. When a stock is above goal, one expects that escapements will fluctuate rather than continue to increase. In 1993 for the 5-yr trend analysis, 1993 replaced the 1988 escapement level in the trend scoring (1988 was above goal but down from 1989 while 1993 was below goal but up from 1992); this resulted in an improved classification over 1992 (from IND to R) which seems counter intuitive.

Although the new CTC system has limitations for classifying stocks that have at one time reach goal levels, it is an improvement over the old CTC classification system. The Nass shows the decisiveness of the two new systems over the old one; the old system consistently classified the stock as indeterminate while the other two classified it as rebuilding through 1990 and then changed to not rebuilding with the large drop in escapements in 1991. If we are to monitor the behavior and status of the stocks and not just try and predict if they will be at or above goal level in 1998, then we need a system that is responsive to large changes in levels and trends but allows some natural fluctuations without causing undue concern. The amount of natural fluctuation will be stock specific and will be dependent both on the natural fluctuations in the population and in the amount of measurement error in determining escapements.

This comparison of scoring criteria shows that one should not place to much importance over the changing number of stocks in each classification from year to year as this is more likely to be the result of the scoring systems than of changes in the stocks. It is well known that salmon abundance fluctuates from year to year depending on many more factors than just harvest pressure. At this point in time, with 10 to 13 years of the PST rebuilding program past, we can tell which stocks have responded positively and which have not. It is important now to look individually at the stocks in the three Never Showing Improvement status categories (Table 4) to determine why they have not responded. For the three stocks with highly fluctuating returns (Area 8, Harrison, Skagit summer/fall), it would be well to start by examining the escapement estimation method for inconsistencies or deficiencies. For the eight stocks that have shown relatively stable returns throughout the rebuilding period, but are at levels at or below base period levels, it would do well to examine whether the escapement goals are appropriate and whether the exploitation rates are either so low that PST management action to not affect the stock or so high that they remain above MSY levels. If the later case is true, where is the exploitation taking place? For the one

stock that has shown continued decline[1] (Area 6), both escapement estimations and harvest pressure should be carefully examined.

[1] While the CTC 1993 Annual Report states that "declines in escapements have not been halted for 8 of the 18 stocks classified as 'Indeterminate' or 'Not Rebuilding'" (page ix), continued decline is defined as "current escapements below base" (Table 2-8) rather than a continued negative trend during the rebuilding period.

Perhaps we should look at the stock rebuilding program in this way rather than quoting percentage rebuilding, indeterminate, and not rebuilding.

Stocks at healthy levels. Harvest and enjoy.

Situk, Andrew, Stikine, Skeena, Rivers, Middle Fraser, Quillayute, Grays Harbor springs and falls, Columbia River brights, Lewis

Stocks probably healthy, but watch closely.

King*, Blossom*, Keta, Taku, Unuk, Chickamin, Yakoun, Upper Fraser, Green River

Determine why stock escapements have leveled off below goal level. Is escapement goal realistic?

Thompson*

Determine cause of initial rebuilding followed by decline. Over escapement, increased harvest pressure, poor marine survival?

Nass*, Skagit spring*

Determine why there has been NO response from rebuilding program. Not fished by PST fisheries, overall exploitation rate not diminished by restrictions in some fisheries? Can these stocks be rebuilt by further PST management restrictions or should they not be indicator stocks?

Alsek*, Smith*, WCVI*, L. Georgia Str.*, Stillaguamish*, Snohomish*, Columbia River springs* and summers*

Determine if continual decline is likely and why. Has the exploitation rate increased? Are escapement estimates reliable?

Area 6*

Determine what is causing such variable escapement estimates, are estimation procedures reliable? Are these stocks useful indicator stocks?

Area 8*, U. Georgia Str.*, Harrison*, Skagit summer/fall*

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* indicates stocks of concern according to CTC 1993 annual report (classified as indeterminate and not rebuilding).

TABLE 1. Chinook rebuilding scoring criteria.

	Does system require a Base Period	Goal	Scoring
I. Old CTC System			
Old Above Goal compares 4 year average with goal and each of last 5 years against goal			AG if avg > =goal and 4 or 5 of last 5 yrs > = goal
Old Mean Criterion compares rebuilding average with base period average	yes	no	+1 diff>10%, 0 else, -1 diff<-10%
Old Line Criterion compares recent 3 years of actual escapements with target escapements (if > then 1, else 0)	yes	yes	+1 SUM= 3, 0 1 or 2, -1 0
Old Trend Criterion measures for a linear trend during the rebuilding period; linear regression analysis	no, but starting point is influential	no	+1 slope >0 and r-sq >0.25, 0 else, -1 slope <0 and r-sq <0.25
II. Buffer 2-criteria system (buffer = 0.25 * CV of 75-79 period)			
Buffer Above Goal compares 5 year average with goal and each of last 5 years against goal			AG if avg>goal and 4 or 5 of last 5 yrs > = goal
Buffer Mean Criterion compares recent 5 year average with target 5 year average	yes	yes	+1 5-yr avg >target-avg, 0 >target-avg minus buffer, -1 else
Buffer Line Criterion compares each of 5 most recent years with respective target minus buffer; (if > then 1, else 0)	yes	yes	+1 Sum= 5 or 4, 0 3, -1 2 to 0
III. New CTC 3-criteria system (no buffers)			
New CTC Above Goal compares 5 year average with goal and each of last 5 years against goal (= Buffer Above Goal above)			AG if avg>goal and 4 or 5 of last 5 yrs > = goal
New CTC Mean Criterion compares recent 5 year average with target 5 year average	yes	yes	+1 actual avg > target -1 else
New CTC Line Criterion compares each of 5 most recent years with respective target; (if > then 1, else 0)	yes	yes	+1 Sum= 5-3 -1 2-0
New CTC Trend Criterion compares each of 5 most recent years with previous year; (if > then 1, else 0)	no	no	+1 Sum= 5-4 0 3-2 -1 1-0

TABLE 2. Classification of stocks from 1985 to 1993 using the three scoring systems.

Stock	System	1985	1986	1987	1988	1989	1990	1991	1992	1993
Situk	old CTC	IND	PR	AG	AG	AG	AG	AG	AG	AG
	buffer	R	R	AG	AG	AG	AG	AG	AG	AG
	new CTC	R	R	AG	AG	AG	AG	AG	AG	AG
King Salmon	old CTC	PR	PR	PR	PR	PR	IND	PN	PN	PN
	buffer	R	R	R	R	R	R	PR	N	N
	new CTC	R	R	R	R	R	R	R	N	N
Andrew Creek	old CTC	IND	IND	R	R	AG	AG	AG	AG	AG
	buffer	PR	PR	PR	R	AG	AG	AG	AG	AG
	new CTC	R	R	R	R	AG	AG	AG	AG	AG
Blossom (index)	old CTC	AG	AG	AG	AG	AG	AG	PN	PN	PN
	buffer	AG	AG	AG	AG	AG	AG	R	R	R
	new CTC	AG	AG	AG	AG	AG	AG	IND	IND	IND
Keta (index)	old CTC	AG	AG	AG	AG	AG	AG	AG	PN	PN
	buffer	AG	AG	AG	AG	AG	AG	AG	PR	PR
	new CTC	AG	AG	AG	AG	AG	AG	AG	IND	R
Alsek	old CTC	N	PN	PN	PN	PN	PN	N	N	N
	buffer	N	N	N	N	N	N	N	N	N
	new CTC	N	N	N	N	N	N	N	N	N
Taku	old CTC	IND	IND	IND	IND	IND	PR	PR	PR	PR
	buffer	N	N	N	PN	IND	PR	IND	PR	R
	new CTC	N	N	N	N	N	N	N	N	IND
Stikine	old CTC	IND	IND	IND	IND	PR	PR	PR	PR	PR
	buffer	R	IND	N	R	R	R	R	R	R
	new CTC	R	IND	N	R	R	R	R	R	R
Unuk (index)	old CTC	AG	AG	AG	AG	AG	AG	PN	PN	PN
	buffer	AG	AG	AG	AG	AG	AG	PR	PR	IND
	new CTC	AG	AG	AG	AG	AG	AG	IND	R	IND
Chickamin (index)	old CTC	AG	AG	AG	AG	AG	AG	AG	PN	PN
	buffer	AG	AG	AG	AG	AG	AG	AG	R	PR
	new CTC	AG	AG	AG	AG	AG	AG	AG	IND	R
Yakoun	old CTC	IND	IND	IND	IND	PR	AG	AG	AG	AG
	buffer	PR	IND	IND	PR	R	AG	AG	AG	AG
	new CTC	IND	IND	IND	R	R	AG	AG	AG	AG
Nass	old CTC	IND	IND	IND	IND	IND	IND	IND	IND	IND
	buffer	PR	PR	R	PR	PR	R	PN	N	N
	new CTC	R	R	R	R	R	R	N	N	N

Table 2. continued.

Stock	System	1985	1986	1987	1988	1989	1990	1991	1992	1993
Skeena	old CTC	PR	PR	PR	AG	AG	AG	AG	AG	AG
	buffer	R	R	R	AG	AG	AG	AG	AG	AG
	new CTC	R	R	R	AG	AG	AG	AG	AG	AG
Area 6 Index	old CTC	IND	PN	PN	PN	PN	PN	PN	PN	PN
	buffer	N	N	N	N	N	N	N	N	N
	new CTC	N	N	N	N	N	N	N	N	N
Area 8 Index	old CTC	IND	IND	IND	IND	PN	PN	PN	PN	PN
	buffer	PN	PN	PN	PN	N	N	N	N	N
	new CTC	IND	IND	IND	IND	N	N	N	N	N
Rivers Inlet	old CTC	IND	IND	PR	PR	IND	IND	IND	PR	PR
	buffer	PR	PR	R	R	R	R	R	R	R
	new CTC	R	R	R	R	R	R	R	R	R
Smith Inlet	old CTC	PN	PN	PN	PN	PN	PN	PN	PN	PN
	buffer	PN	N	N	N	N	N	N	N	N
	new CTC	N	N	N	N	N	N	N	N	N
W. Coast Van. Island	old CTC	IND	IND	PN	IND	IND	IND	IND	PN	PN
	buffer	PN	PN	N	N	N	N	N	N	N
	new CTC	N	N	N	N	N	N	N	N	N
Upper Geor. St.	old CTC	PR	IND	IND	IND	IND	IND	IND	IND	IND
	buffer	R	R	R	R	R	PR	PR	PR	IND
	new CTC	R	R	R	R	R	IND	IND	IND	IND
Lower Geor. St.	old CTC	IND	PN	PN	PN	PN	PN	PN	PN	PN
	buffer	N	N	N	N	N	N	N	N	N
	new CTC	N	N	N	N	N	N	N	N	N
Upper Fraser	old CTC	PR	PR	PR	AG	AG	AG	AG	AG	IND
	buffer	R	R	R	AG	AG	AG	AG	AG	R
	new CTC	R	R	R	AG	AG	AG	AG	AG	IND
Middle Fraser	old CTC	PR	PR	PR	PR	PR	AG	AG	AG	AG
	buffer	R	R	R	R	R	AG	AG	AG	AG
	new CTC	R	R	R	R	R	AG	AG	AG	AG
Thompson	old CTC	IND	IND	PR	PR	IND	IND	IND	IND	IND
	buffer	N	PR	R	R	R	R	R	R	PN
	new CTC	N	R	R	R	R	R	R	R	N
Harrison	old CTC				IND	PN	IND	IND	IND	PN
	buffer				N	N	N	N	N	N
	new CTC				N	N	N	N	N	N

Table 2. continued.

Stock	System	1985	1986	1987	1988	1989	1990	1991	1992	1993
Skagit spring	old CTC	IND	IND	PR	PR	IND	IND	IND	IND	IND
	buffer	IND	IND	PR	R	R	IND	N	N	N
	new CTC	IND	IND	R	R	R	IND	N	N	N
Skagit sum/fall	old CTC	IND	IND	IND	IND	PN	IND	PN	PN	PN
	buffer	N	IND	N	IND	N	N	N	N	N
	new CTC	N	IND	N	IND	N	N	N	N	N
Stillaguamish	old CTC	IND	IND	IND	IND	IND	PN	IND	IND	IND
	buffer	N	IND	IND	IND	IND	N	N	N	N
	new CTC	N	N	IND	IND	IND	N	N	N	N
Snohomish	old CTC	PN	PN	PN	PN	PN	PN	PN	PN	PN
	buffer	N	N	N	N	N	N	N	N	N
	new CTC	N	N	N	N	N	N	N	N	N
Green	old CTC	PN	PN	IND	IND	IND	AG	AG	AG	IND
	buffer	N	N	N	IND	PR	AG	AG	AG	PR
	new CTC	N	N	N	IND	R	AG	AG	AG	R
Quillayute sum.	old CTC	IND	PN	PN	IND	PN	IND	AG	AG	AG
	buffer	N	N	N	N	PN	PR	AG	AG	AG
	new CTC	N	N	N	N	N	R	AG	AG	AG
Grays Hrb. spr.	old CTC	PR	PR	PR	PR	PR	AG	PR	AG	PR
	buffer	R	R	R	R	R	AG	R	AG	R
	new CTC	R	R	R	R	R	AG	IND	AG	IND
Grays Hrb. fall	old CTC	IND	PR	PR	PR	PR	AG	AG	AG	PR
	buffer	IND	PR	R	R	R	AG	AG	AG	R
	new CTC	N	R	R	R	R	AG	AG	AG	IND
Col. Upr. spring	old CTC	IND	IND	IND	IND	PN	PN	PN	PN	PN
	buffer	IND	IND	IND	N	N	N	N	N	N
	new CTC	N	N	N	N	N	N	N	N	N
Col. Upr. sum.	old CTC	PN	IND	IND	IND	PN	PN	PN	PN	PN
	buffer	N	N	N	N	N	N	N	N	N
	new CTC	N	N	N	N	N	N	N	N	N
Col. Upr. bright	old CTC	PR	AG	AG	AG	AG	AG	AG	AG	AG
	buffer	R	AG	AG	AG	AG	AG	AG	AG	AG
	new CTC	R	AG	AG	AG	AG	AG	AG	AG	AG
Lewis	old CTC	AG	AG	AG	AG	AG	AG	AG	AG	AG
	buffer	AG	AG	AG	AG	AG	AG	AG	AG	AG
	new CTC	AG	AG	AG	AG	AG	AG	AG	AG	AG

TABLE 3. Classification results of the three systems for 1993. Stocks are grouped by area.

	Classification			
STOCK	OLD CTC	BUFFER	NEW CTC	COMMENTS
SITUK	*AG	*AG	*AG	same
KING SALMON	PN	N	N	same
ANDREW CREEK	*AG	*AG	*AG	same
BLOSSOM	PN	R	IND	**all 3 systems classify it differently (voted IND)**
KETA	PN	PR	R	**old says not rebuilding, 2 new say rebuilding**
ALSEK	N	N	N	same
TAKU	PR	R	IND	**old & buffer say rebuilding, new CTC says indeterminate (voted R)**
STIKINE	PR	R	R	same
UNUK	PN	IND	IND	**old says not rebuilding, 2 new say indeterminate (voted R)**
CHICKAMIN	PN	PR	R	**old says not rebuilding, 2 new say rebuilding**
YAKOUN	*AG	*AG	*AG	same
NASS	IND	N	N	**old says indeterminate, 2 new say not rebuilding**
SKEENA	*AG	*AG	*AG	same
AREA 6	PN	N	N	same
AREA 8	PN	N	N	same
RIVERS INLET	PR	R	R	same
SMITH INLET	PN	N	N	same
WCVI	PN	N	N	same
U GEORGIA ST	IND	IND	IND	same (voted IND)
L GEORGIA ST	PN	N	N	same
UPPER FRASER	IND	R	IND	**buffer says rebuilding, 2 other say indeterminate (voted AG)**
MIDDLE FRASER	*AG	*AG	*AG	same
THOMPSON	IND	PN	N	**old says indeterminate, 2 new say not rebuilding**
HARRISON	PN	ERR	N	
SKAGIT SP	IND	N	N	**old says indeterminate, 2 new say not rebuilding**
SKAGIT S/F	PN	N	N	same
STILLAGUAMISH	IND	N	N	**old says indeterminate, 2 new say not rebuilding**
SNOHOMISH	PN	N	N	same
GREEN	IND	PR	R	**old says indeterminate, 2 new say rebuilding**
QUILLAYUTE SU	*AG	*AG	*AG	same
GRAYS HARBOR SP	PR	R	IND	**old and buffer say rebuilding, new says indeterminate (voted R)**
GRAYS HARBOR FALL	PR	R	IND	**old and buffer say rebuilding, new says indeterminate (voted R)**
COL. UPRIVER SPRING	PN	N	N	same
COL. UPRIVER SUM.	PN	N	N	same
COL. UPRIVER BRIGHT	*AG	*AG	*AG	same
LEWIS	*AG	*AG	*AG	same

TABLE 4. Classification results with stocks grouped by status category.

STOCK	1993 Classification OLD CTC	BUFFER	NEW CTC	COMMENTS ON REBUILDING
ABOVE GOAL				
SITUK	*AG	*AG	*AG	AG since 87 (base period average above goal, 2 yrs (82 & 83) below goal, old system classified it as IND 83-85, and PR 86; other two systems classified it as R 83-86)
ANDREW CREEK	*AG	*AG	*AG	AG since 89
YAKOUN	*AG	*AG	*AG	AG since 90
SKEENA	*AG	*AG	*AG	AG since 88
MIDDLE FRASER	*AG	*AG	*AG	AG since 90
QUILLAYUTE SU	*AG	*AG	*AG	AG since 91
COL. UPRIVER BRIGHT	*AG	*AG	*AG	AG since 86
LEWIS	*AG	*AG	*AG	AG since base period
ONCE CLASSIFIED ABOVE GOAL				
BLOSSOM	PN	R	IND	AG from 85 to 90. In 90 escapement dropped below goal, in 91 & 92 dropped below target, in 93 was above goal again. From 91 to 93 the old CTC system classified it as PN, the buffer system as R and the new CTC as IND (voting left it as IND).
KETA	PN	PR	R	AG from 81 to 91. In 91 & 92 escapement dropped below target, in 93 above goal again. In 92 & 93 the old CTC system classified it as PN, the buffer system as PR, and the new CTC system as IND in 91 and R in 92.
UNUK	PN	IND	IND	AG from 84 to 90. In 90 & 91 escapement below goal, in 92 & 93 above goal. Old CTC system classified it as N since 1991, the buffer as R in 91 & 92 and IND in 93, and the new CTC as IND in 91, R in 92, and IND in 93 (voting changed it to R in 93).
CHICKAMIN	PN	PR	R	AG from 85 to 91. In 91 escapement fell below goal, in 92 & 93 below target. In 92 the old CTC system classified it as PN, the buffer system as R and the new CTC as IND. In 93 the old CTC keeps it as PN, the buffer as PR, while the new CTC system classified it as R.
UPPER FRASER	IND	R	IND	AG from 88 to 92. In 92 escapement dropped below goal, in 93 below target. In 93 only buffer system classified it as R, voting raised the new CTC classification to ABOVE GOAL.
GREEN	IND	PR	R	AG from 90 to 92. In 92 & 93 escapement dropped below goal. Prior to 89 it was N, PN, or IND according to all three systems, in 89 the old CTC classified it as IND, the buffer as PR, and the new CTC as R. In 93 the buffer and new CTC systems classified it as PR and R while the old CTC system classified it as IND.

Table 4. continued.

STOCK	1993 Classification OLD CTC	BUFFER	NEW CTC	COMMENTS ON REBUILDING
GRAYS HARBOR SP	PR	R	IND	AG in 90 and 92. In 91 & 93 escapement dropped slightly below goal. Prior to 89 all three systems classified it as PR or R. In 91 and 93 the old CTC classified it as PR, the buffer as R, and the new CTC as IND (voting raised the new CTC classification to R).
GRAYS HARBOR FALL	PR	R	IND	AG from 90 to 92. In 91 & 93 escapement dropped slightly below goal. From 86 to 89 all three systems classified it as PR or R. In 93 the old CTC classified it as PR, the buffer as R, and new CTC system as IND (voting raised the new CTC classification to R).
LOOKS LIKE IT IS REBUILDING				
TAKU	PR	R	IND	This stock looks like it is rebuilding with a marked increasing trend since 84, although most of its escapements are below the base-to-goal line. The old CTC system classified it as IND until 90 and as PR since then; the new CTC system consistently classified it as N until 93 when it classified it as IND (voting subsequently raised it to R). The buffer system started out as classifying it as N (85-87) and then PN in 88 and IND in 89, since 1989 it has fluctuated between PR, IND, and R.
STIKINE	PR	R	R	This stock looks like it is rebuilding with a marked increasing trend since 84. Since 88 the buffer and new CTC systems classified as R, since 89 the old CTC as PR.
RIVERS INLET	PR	R	R	This stock looks like it is rebuilt with an increasing trend since 86; although it experienced a decline from 87-89, it has been well above goal from 91-93. Since 85 the buffer and new CTC have classified it as rebuilding. The old CTC systems fluctuated between IND and R.
WAS REBUILDING ONCE				
KING SALMON	PN	N	N	Prior to 90 escapements were above target line and all three systems classified it as PR or R. Escapement dropped below target line in 90 and continued dropping next 2 years; was above goal in 93. The old CTC system classified it as IND in 91 and PN thereafter. The buffer and new CTC systems first dropped classification to N in 92.
NASS	IND	N	N	Through 90 escapements were close to or above target line, in 91 below base, increased in 92 & 93 but still below target. The old CTC classified it as IND the entire period; the buffer and new CTC system as PR

Table 4. continued.

STOCK	1993 Classification OLD CTC	BUFFER	NEW CTC	COMMENTS ON REBUILDING
				or R through 90 and PN or N from 91-93.
THOMPSON	IND	PN	N	Escapements increased from 84 to 86 and then leveled off at a level below goal. 91 & 93 escapements were below target. The old CTC system classified it as IND most years (PR in 87-88). The buffer and new CTC systems classified it as PR or R 86-92 and as PN or N in 93.
SKAGIT SP	IND	N	N	Escapement increased from below base to above goal in 85 and has declined since then to below base again. The old CTC system classified it as IND most years (PR in 87-88). The buffer and new CTC systems classified it as R from 87-89, as IND in 90, and as N in 91-93.
NEVER SHOWING IMPROVEMENT - FAIRLY STEADY RETURNS				
ALSEK	N	N	N	Escapements at or below base period to 92, above base but below target in 93. Classified as PN or N by all three systems entire period.
SMITH INLET	PN	N	N	Escapements at or below base period throughout the rebuilding period. Classified as PN or N by all three systems entire period.
WCVI	PN	N	N	Escapements around base period level throughout the rebuilding period. Classified as IND by old CTC most years to 91 and as PN 92-93. The buffer and new CTC systems classify it as PN or N the entire period.
L GEORGIA ST	PN	N	N	Escapements at or below base period throughout the rebuilding period. Classified as PN or N by all three systems since 86.
STILLAGUAMISH	IND	N	N	Escapements around base period level throughout the rebuilding period, levels above target in 85-87 and 91. Classified as IND most years by old CTC system. The buffer and new CTC systems classified it as IND or N through 89 and as N 90-93.
SNOHOMISH	PN	N	N	Escapements at or below base period throughout the rebuilding period. Classified as PN or N by all three systems entire period.
COL. UPRIVER SPRING	PN	N	N	Escapements around base period level throughout the rebuilding period. Classified as IND by old CTC and buffer systems 85-87 and as N by new CTC system 85-87. All systems classified it as PN or N since 88.
COL. UPRIVER SUMMER	PN	N	N	Escapements around base period level throughout the rebuilding period. Classified as IND by old CTC 86-88 and as PN 89-93. The buffer and new CTC systems classified it as N the entire period.

Table 4. continued.

STOCK	1993 Classification OLD CTC	BUFFER	NEW CTC	COMMENTS ON REBUILDING
NEVER SHOWING IMPROVEMENT - VARIABLE RETURNS				
AREA 8	PN	N	N	Escapements showing large annual fluctuations from well below base period level to levels above target in 84-86 but never reaching goal. The old and new CTC systems classified it as IND from 85-88 while the buffer classified it as PN. From 89-93 the old CTC system classified it as PN and the buffer and new CTC as N.
U GEORGIA ST	IND	IND	IND	Escapements have been extremely variable from year to year jumping from below base to above goal to below base in single years. Prior to 90 an increasing trend could be seen (except for low level in 86); however below base level escapements in 90 and 93 remove any over all trend pattern. The old CTC system classified it as IND 86-93. The buffer system classified it as R through 89, as PR through 92 and as IND in 93. The new CTC system classified it as R through 89 and as IND 90-93. Although it has been classified as rebuilding in earlier years, the large annual fluctuations since 86 make it impossible to know what is happening to the rebuilding status of this stock and, therefore, it is placed in this category..
HARRISON	PN	N	N	Escapement records start in 84, analyses results in 88. Escapements are highly variable around base (84) level. The old CTC system classified it as IND or PN, the buffer and new CTC systems classified it as N from 88-93.
SKAGIT S/F	PN	N	N	Since 1985 the buffer and new CTC systems classified it as not rebuilding (except two years 86 & 88 when it was IND). The old CTC system mostly classified it as IND but since 1991 as PN.
NEVER SHOWING IMPROVEMENT - IN DECLINE				
AREA 6	PN	N	N	Escapements below base level entire period with 89-93 levels being lowest since 75. Classified as PN by old CTC system since 86 and as N by buffer and new CTC system the entire period.

key: AG = above goal, R = rebuilding, PR = probably rebuilding, IND = indeterminate, PN = probably not rebuilding, N = not rebuilding. Note that the new CTC system does not use the PR and PN classifications. For stocks classified as indeterminate, voting by the RAWG members may place it in another classification.

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